Eat Weight Disord (2015) 20:457–463
DOI 10.1007/s40519-015-0198-8

ORIGINAL ARTICLE

Prevalence and risk factors for pica during pregnancy in Tehran, Iran

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Received: 9 April 2015 / Accepted: 28 May 2015 / Published online: 5 July 2015

Abstract
Introduction and objectives Pica is an eating disorder characterized by the persistent ingestion of substances that the consumer does not define as food. The exact cause of pica is often unknown. The purpose of this study was to determine the prevalence of pica during pregnancy and its related risk factors.
Method This cross-sectional study was carried out in health care centers in west of Tehran. Three hundred women were selected by stratified sampling method from the population. Demographic information and characteristics of pica during pregnancy, such as the kind, the onset, duration, frequency and the reasons, and also iron supplementation status before and during pregnancy and kind of infant feeding were collected via interview and questionnaire. The data were analyzed by chi square test and logistic regression in SPSS 16.
Results The prevalence of pica among the studied population was 8.33 %, and pagophagia (ice and freezer frost) was the most common form of pica which is characterized by the ingestion of non-food substance (76 %). Sixty-four percent of women reported practicing pica regularly on a daily basis. In this study, there was significant association between pica practice and education, unwanted pregnancy, pregnancy complications, the levels of economic satisfaction, iron supplementation during pregnancy, kind of infant feeding, and type of delivery. However, there was no significant association between pica and age, employment, pregnancy ranks, the history of abortions or stillbirths, infant sex, and iron supplementation before pregnancy.
Conclusions Iron supplementation during pregnancy should be more considered. Also women with low education should be asked concerning pregnancy pica.

Keywords Prevalence · Pica · Pagophagia · Pregnancy

Introduction

Most women during pregnancy experience disturbance in their normal eating patterns [1]. Pica is an eating disorder characterized by persistent ingestion of substances that the consumer does not define as food; it is a prevalent phenomenon that has been documented in nearly every culture [2, 3]. The most common forms of pica are Geophagia (the intake of clay or dirt) and Pagophagia (the intake of ice or freezer frost) [4]. Other reported pica substances include ashes, cigarette butts, soap, baking soda, baking powder, burnt match heads, hair, and pieces of papers, paint chips, charcoal, chalk, and coffee grounds. Pica is frequently observed in children, individuals with development disabilities, and pregnant women [5].

Displacement effect of non-food substances could result in reduce intake of nutritious foods leading to inadequate dietary intakes of essential nutrients [6].

An increase in parasitic infection, electrolyte disturbance, gastrointestinal complication, oral and dental injury, lead poisoning, and iron-deficiency anemia has been linked with pica [7–11]. Pica also has been associated with

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maternal and prenatal mortality [12]. Also head circumference of infants in mothers with pica during pregnancy is lower than those of non-pica women [13]. The prevalence of pregnancy pica varied widely depending on the characteristics of the population studied [5]. Published data reveal a prevalence of pica between 0.02 and 74 % [8]. The prevalence of pica during pregnancy in Zahedan, a city in south east of Iran, is reported to be 25.3 % [11].

The exact cause of pica is often unknown. It is a worldwide problem that has no barriers, such as age, race, sex, or geographic region [11]. Several etiologies of pica have been proposed including hunger, psychopathology, culture, micronutrient deficiencies, gastrointestinal distress, and increased exposure to pathogens and toxin [3, 14].

Pica prevalence and its related risk factors are less studied in the Iranian population; the purpose of this study was to determine the prevalence of pica during pregnancy and its related risk factors in newly delivered women.

Methods

This cross-sectional study was carried out from March to May 2014, among women who had referred to health care centers supported by Shahid-Beheshti University of Medical Science in the west of Tehran. We selected randomly 8 urban health care centers among 16 centers. These 8 centers provided a good distribution of all 16 centers based on covered population and geographic area.

Three hundred women were selected randomly from these health care centers. Sampling technique was stratified (each center as a stratum), number of samples for each center was proportional to the size of it.

The inclusion criteria were aged between 18 and 45 years, with no history of chronic disease (such as cardiovascular disease, diabetes, cancers, and endocrine disease) and consent to participate in the study.

Demographic and socio-economic characteristics (including maternal age, education, occupational status, and the levels of economics satisfaction), obstetric information (including pregnancy ranks, the history of abortions or stillbirths, infant sex, unwanted pregnancy, pregnancy complications (such as gestational diabetes mellitus, Pre-eclampsia, anemia, High blood pressure, nausea and vomiting, Premature contractions and Bleeding, and type of delivery), regular intake of iron supplements before and during pregnancy, and kind of Infant feeding (breast or formula feeding) collected via interview and questionnaire.

The questionnaire of pica during pregnancy included the kind (ice, freezer frost, soil, rosary and praying clay, raw starch, cigarette ashes, tea or coffee grounds, burnt matches heads, burnt bread, hair, tissue boxes, oil or petrol, baking powder, baking soda, tobacco, charcoal, and or any other non-food substances that are eaten during pregnancy and not listed above), the onset, duration, frequency (daily, weekly, or monthly) and the reasons (unable to give them, satisfy craving, relief of nausea, reduced stress and anxiety, and other reasons) of pica practice.

The levels of economic satisfaction were measured subjectively (by women) with scoring among 1–10. For data analysis, the scores fall in 3 categories:

a. Low satisfaction: 1 through 4, b. moderate Satisfaction: 5 through 7 and c. high satisfaction: 8 through 10.

The data were analyzed using statistical tests, including Chi square test, logistic regression, using the Statistical Package for Social Sciences version 16 (SPSS Inc., Chicago, IL, USA).

Results

The mean of age was 28.7 ± 5.6 (18–45) year. Two hundred sixty (86.7 %) of women were housewives and 40 (13.3 %) were employed. Sixty-four (21.3 %) of women were undergraduate and 236 (78.7 %) were diploma or higher.

The prevalence of pica among the studied samples was 8.33 %. Sixty-four percent of women were reported practicing pica regularly on daily basis and Pagophagia (ice and freezer frost) was the most common form of pica which is characterized by the ingestion of non-food substance (76 %) (Table 1). For gestational age, the prevalence of pica practice was the most in first trimester (84 %). Among the reasons which were given for practicing pica, 40 % of women were unable to give them, 32 % declared reduced stress and anxiety, 16 % to satisfy craving, 4 % relief of nausea, and 8 % reported other reasons. The duration of pica practice is mentioned in the Table 2.

The result of study showed no significant association between age and pica practice ($P = 0.525$). Fifteen (60 %) women who were practicing pica were undergraduate and there was significant association between education and pica ($P < 0.001$).

In this study, there was significant association between unwanted pregnancy and pica ($P = 0.009$). Also, there was

Table 1 Frequency of non-food substances

Non-food item	*N* (%)
Ice	14 (56)
Freezer frost	2 (8)
Ice and freezer frost	3 (12)
Rosary and praying clay	6 (24)
Total	25 (100)

Table 2 Duration of pregnancy pica

Duration of pregnancy pica (month)	*N* (%)
1	2 (8)
2	3 (12)
3	4 (16)
4	2 (8)
6	5 (20)
7	2 (8)
8	7 (28)
Total	25 (100)

significant association between levels of economic satisfaction and pica ($P < 0.001$).

Iron supplementation before pregnancy was only reported in 24 % ($n = 72$) women, while most of the women (83 % or 249 women) were taking iron supplements during pregnancy. The results of study showed that women who iron supplemented before pregnancy for at least one month, less practiced pregnancy pica ($P = 0.050$). Also there was significant association between pregnancy iron supplementation and pica ($P < 0.001$). The duration of iron supplementation before and during pregnancy is noted in Table 3. Cesarean delivery was significantly greater in women practicing pica ($P = 0.018$).

Table 3 Duration of iron supplementation before and during pregnancy

Duration (days)	*N*	%
Before		
0	228	76
30	14	4.7
60	15	5
90	30	10
120	2	0.7
150	1	0.3
180	5	1.7
210	1	0.3
360	3	1
Total	299	99.7
During		
0	51	17
30	5	1.7
60	5	1.7
90	12	4
120	11	3.7
150	25	8.3
180	25	8.3
210	4	1.3
240	17	5.7
270	144	48
Total	299	99.7

Data were missed in this table

Twenty-six women (8.7 %) were not breastfeeding mothers, and 36 % ($n = 9$) of women in pica group did not breastfeed their infants, and there was significant association between pica practice and breast feeding ($P < 0.001$).

In this study, although the prevalence of pica was higher in employed women but it was not significant ($P = 0.306$).

The pica practice was higher in women with history of abortions or stillbirths but the difference was not significant ($P = 0.078$). Among other factors examined, there was no significant association between pregnancy ranks ($P = 0.601$) and infant sex with pica practice ($P = 0.269$) (Table 4).

In logistic regression analyses, among the significant factors, the levels of education, pregnancy complication, and iron supplementation during pregnancy were significant (Table 5).

Discussion

In this study, pica is defined as an ingestion of non-food substances, such as Pagophagia [4]. Pagophagia is a particular expression of the more general phenomenon of pica [15]. The prevalence of pica practice during pregnancy varies in different parts of the world. The prevalence of pica during pregnancy (by considering Pagophagia as a pica) in Latin America has been reported to be 23–44 % [4]. For example, it was 44 % in Mexico City by Simpson [16], and 23.2 % in Argentina by López [17]. African countries have a higher prevalence of pica during pregnancy. It was reported in 63.7 % in Tanzania [6], 47 % in Ghana, [2] and 40.4 % in Sudan [18]. The prevalence of pica in Denmark is very low. Mikkelsen and colleagues examined the prevalence of pica in 100 thousand pregnant women. It was reported only in 14 (0.02 %) women [19]. In Washington DC, the prevalence of pica was 8.1 % [13].

The prevalence of pica in this study was 8.33 % which is lower than that in Latin America and Africa but higher than that in Europe and North America. The prevalence of pica during pregnancy at 2000 in Tehran was 25.1 % [20]. Thus, the prevalence of this eating disorder during pregnancy is dropped. The decrease of pregnancy pica in Tehran maybe due to the growth in education levels, awareness of women concerning iron supplementation and also, more attention to them by their husbands and family as a result of reduced birth rate. Unfortunately the Cesarean delivery Increased Compared to the past and is growing, so the women fear and anxiety during pregnancy about travail declined. These are changes in Iranian society which may be causes of decreased pica practice.

The kind of Pica varied widely in different regions of the world depending on the type of material which is

Table 4 Association of studied variables with pica practice

Variables	Pica practice		*P* value*
	No *N* (%)	Yes *N* (%)	
Mother age			
<26	82 (27.3)	10 (3.3)	0.525
26–34	151 (50.3)	11 (3.7)	
>35	42 (14)	4 (1.3)	
Education level of mother			
Undergraduate	49 (16.3)	15 (5)	0.000
Graduate	226 (75.3)	10 (3.3)	
Mother occupational status			
Housewife	240 (80)	20 (6.7)	0.306
Employed	35 (11.7)	5 (1.7)	
Levels of economic satisfaction			
Low	51 (17.1)	14 (4.7)	0.000
Moderate	184 (61.7)	9 (3)	
High	38 (12.8)	2 (0.7)	
Wanted pregnancy			
Yes	225 (75)	15 (5)	0.009
No	50 (16.7)	10 (3.3)	
Pregnancy ranks			
1	131 (43.7)	13 (4.3)	0.601
2	88 (29.3)	9 (3)	
>2	56 (18.7)	3 (1)	
History of abortion or stillbirth			
Yes	57 (19)	9 (3)	0.078
No	218 (72.7)	16 (5.3)	
Iron supplementation before pregnancy			
Yes	70 (23.3)	2 (0.7)	0.050
No	205 (68.3)	23 (7.7)	
Iron supplementation during pregnancy			
Yes	237 (79)	12 (4)	0.000
No	38 (12.7)	13 (4.3)	
Pregnancy complication			
Yes	102 (34)	17 (5.7)	0.002
No	173 (57.7)	8 (2.7)	
Type of delivery			
NVD	68 (22.7)	1 (0.3)	0.018
Cesarean	207 (69)	24 (8)	
Kind of Infant feeding			
Breast feeding	256 (85.9)	16 (5.4)	0.000
Formula feeding	17 (5.7)	9 (3)	

NVD normal vaginal delivery

* Chi square test

available [2]. In the current study, the prevalence of Pagophagia was the highest (72 %). Also Pagophagia has high prevalence in Argentina [21], Ghana [2], Washington DC [13], and Texas [22] but Amilophagia was more prevalent in Tanzania [3].

This study showed a gradual shift from the practice of Geophagia to Pagophagia. Such changes have also been reported in Kumasi by Faustina [2].

The present study showed an association between maternal education and pica during pregnancy. Boatin [8] and Thihalolipavan [9] have shown similar results. It appears that the high level of education increases awareness concerning the complications of pica, but in Saunders study [23], there was no association between education level and pica.

The results of the present study showed that the prevalence of pica was higher in employed women but there was no significant association between employment and pica. This finding is in agreement with the earlier report in Mortazavi study [11]. However, in Boatin study [8], the association between agricultural work and pica was found. The present study was conducted in urban areas and women in our study were not farmers.

In this study, the prevalence of pica practice was the highest in first trimester (84 %). López in Argentina [17], Mortazavi in Zahedan [11], and Khajavishojaii in Tehran [20] has shown similar results, but in Saunders study in Brazil, the prevalence of pica practice was the highest in the second trimester (46.7 %) [23].

In the present study, the association between the levels of economic satisfaction and pica practice was assessed and it was significant. The prevalence of pica practice was high in studies carried out on low-income Mexico-born pregnant women [16] and Nairobi pregnant women [5]. In Garg study, also there was significant association between economic status and pica practice [24] but in Mortazavi [11] and Saunders [23] studies, there was no significant association between economic status and pica practice.

In this study, the association between the levels of economic satisfaction (but not family income) was assessed. A high income maybe does not lead to economic satisfaction. Future studies should consider not only family income but also economic satisfaction.

In the present study, there was significant association between unwanted pregnancies and Pica practice. Unwanted pregnancy causes a lot of stress and anxiety for the mother and family [25]. In this study, 32 % of women declared that pica reduced stress and anxiety during pregnancy, and 75 % of these stressful women had unwanted pregnancy, while the prevalence of unwanted pregnancy among women with no reason for pica and other reasons was 30 and 14.3 %, respectively. So, Pica practice during pregnancy maybe is a response to reduce stress and anxiety caused by unwanted pregnancy.

Anemia is known as an important risk factor for pica behavior [3, 13, 23, 26, 27], and Pagophagia is closely associated with the development of iron-deficiency anemia [10]. We are not sure that the pagophagia is the cause of

Table 5 Final logistic regression model for predicting pregnancy pica

Variables	*P* value	OR	95 % CI	
			Lower	Upper
Unwanted pregnancy	0.56	1.372	0.473	3.979
Pregnancy complication	0.031	2.889	1.104	7.557
Maternal education	0.007	3.823	1.443	10.132
Economic satisfaction				
Low	–	Reference	–	–
Moderate	0.426	1.989	0.366	10.807
High	0.701	0.725	0.140	3.748
Iron supplementation in pregnancy	0.005	4.242	1.552	11.594

Table is based on the results of binary logistic regression (only for significant situations based on Chi square test on Table 4)

OR odds ratio

CI confidence interval

iron deficiency but it is rather a consequence of iron deficiency [28]. Pagophagia could improve non-hematologic symptoms of iron deficiency such as stomatitis and glossitis [29]. In this study, pregnancy anemia among studied women was not assessed, but the results of study showed a significant association between iron supplementation and pica practice. In López study, only 22 % of pregnant women with the pica disorder referred using iron supplement during pregnancy [30]. It seems that iron supplementation before and/or during pregnancy has a protective effect against pica practice, although there were no associations between iron supplementation and pica practice in some studies [8, 20, 26].

The result of study showed no significant association between pregnancy ranks and pica practice. Khajavishojaii [20] and Mortazavi [11] also reported a similar result. It seems that rating pregnancy does not appear to have an important role in the occurrence of pica.

Eating disorder during pregnancy is associated with a complication such as cesarean birth [31]. In this study, there was significant association between pica practice and cesarean birth. Most studies have examined the prevalence of pica during pregnancy; therefore, kind of delivery is unknown. Further studies should be conducted concerning the association between pica and kind of delivery.

Limitation of this study

A. In this study, pregnancy pica was assessed after delivery so, the prevalence of pica maybe has been underestimated because of forgetfulness.
B. In the present study, pica is defined as an ingestion of non-food substances for a period of at least one month, while, in some studies, pica is also defined as the tendency or craving to eat substances other than normal food stuffs [32, 33]. Future studies are needed to determine the prevalence of non-food and food pica during pregnancy in Iran.
C. In this study, there were significant associations between pregnancy pica and maternal education, economic satisfaction, unwanted pregnancy, and iron supplementation during pregnancy. But there was a large difference in sample size in the study groups. Because these factors cannot be matched in these studies, these associations were not statistically powered enough.
D. In this study, maternal age was limited to 18–45 years. The majority of women only in this age range were included in this study; therefore, future studies have to be done with no age limitation.

Conclusions

In the present study, there was a positive association between maternal education and pica practice. So, women with low education require more attention and should be asked concerning pregnancy pica.

Iron supplementation during pregnancy had a protective effect against pica practice. In Iran, iron supplements were given free of charge to pregnant women in health care centers. Health practitioners should explain to pregnant women concerning the importance of taking supplements.

Further studies are needed to identify other related risk factors of pica practice by considering other aspects such as dietary patterns, biochemical, and psychosocial.

Acknowledgments The authors would like to thank from Children Growth Research Center, Qazvin University of Medical Sciences, Qazvin, Iran and Deputy of Research, Qazvin University of Medical and Health Sciences, Qazvin, Iran, for financial support (Grant No.

D.44.21039). Thanks are due to the mothers who participated in our study. We would also like to thank the health care staff for cooperation in collecting the data.

Conflict of interest Authors have no conflict of interests.

Ethical approval The protocol was approved by the Research Council and Ethical Committee of Qazvin University of Medical Sciences, No. D.44.21039. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with 1964 Helsiki deceleration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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